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AN EASILY CONSTRUCTED OPTICAL BENCH

BY

GRAHAM W. MARKS, FRANK COSSEY, AND RALPH MILLS

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AN EASILY CONSTRUCTED OPTICAL BENCH[1]

By Graham W. Marks,[2] Frank Cossey,[3] and Ralph Mills[4]

INTRODUCTION

To determine the focal length of lenses or the performance of lens systems before mounting them permanently, it is desirable to have a device in which one or more lenses can be mounted easily and their positions relative to a light source and screen changed readily. We have designed and constructed such an optical bench and lens holder. The bench is similar to that of Houstoun[5] but has been modified, whereas the lens holder is, we believe, a new design.

DESCRIPTION OF APPARATUS

Bench

The general arrangement of the parts of the bench is shown in figure 1. The base is of oak 3/4 inch by 5 inches by 7-1/2 feet, with a scale consisting of two 1-meter sticks mounted, end to end, along the side. A light source using a 25-watt line filament Mazda lamp is mounted on a wooden stand at one end. The top and sides are shielded with a sheet-iron cover, as shown, but the back is left open for cooling. The wooden front cover consists of two vertical sections, each of which has a rectangular opening. The inside edge of one of the openings is routed out, so that a piece of ground glass can be slipped into position between the two sections. The two sections are then held together by a slot in the base and a screw and wing nut. Cross lines and circles are drawn on the glass to serve as objects. An indicating pin for reading the scale is mounted on the side of the base of the stand in the same plane as the object glass. A similar stand, carrying a ground-glass screen, serves for receiving the image. Another indicating pin for reading the scale is mounted on the side of the base of this stand in the same place as the front of the screen.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Inf. Circ. 7424."

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[5] Houstoun, R. A., A Treatise on Light: Longmans, Green & Co., New York, 7th ed., 1938, p. 69.

Lens Holder

The metal lens holder is a novel type. Detailed construction is shown in figure 2. Ring "A" is of aluminum and consists of two outside rings having an inside diameter of 3-1/2 inches and a central ring with an inside diameter of 4 inches riveted together. Thus, a central groove is formed. This groove carries a steel sliding ring, "B." To this ring and ring "A" six lever arms of equal length are riveted in alternate fashion, as shown. Each lower pair is riveted together. Stationary wheels of brass, which support the lens, are mounted at the ends of the lever arms attached to "A." By sliding the ring "B" clockwise, the wheels are pulled away from each other allowing a lens to be slipped into place. The springs "C" tend to return the sliding ring to its initial position, bringing the wheels closer together and clamping the lens firmly. (The arrow indicates the direction of tension when the mechanism is released.) These springs are made of closely wound, 30-gage, music wire. Lenses as large as 2 inches in diameter can be mounted in the holder.

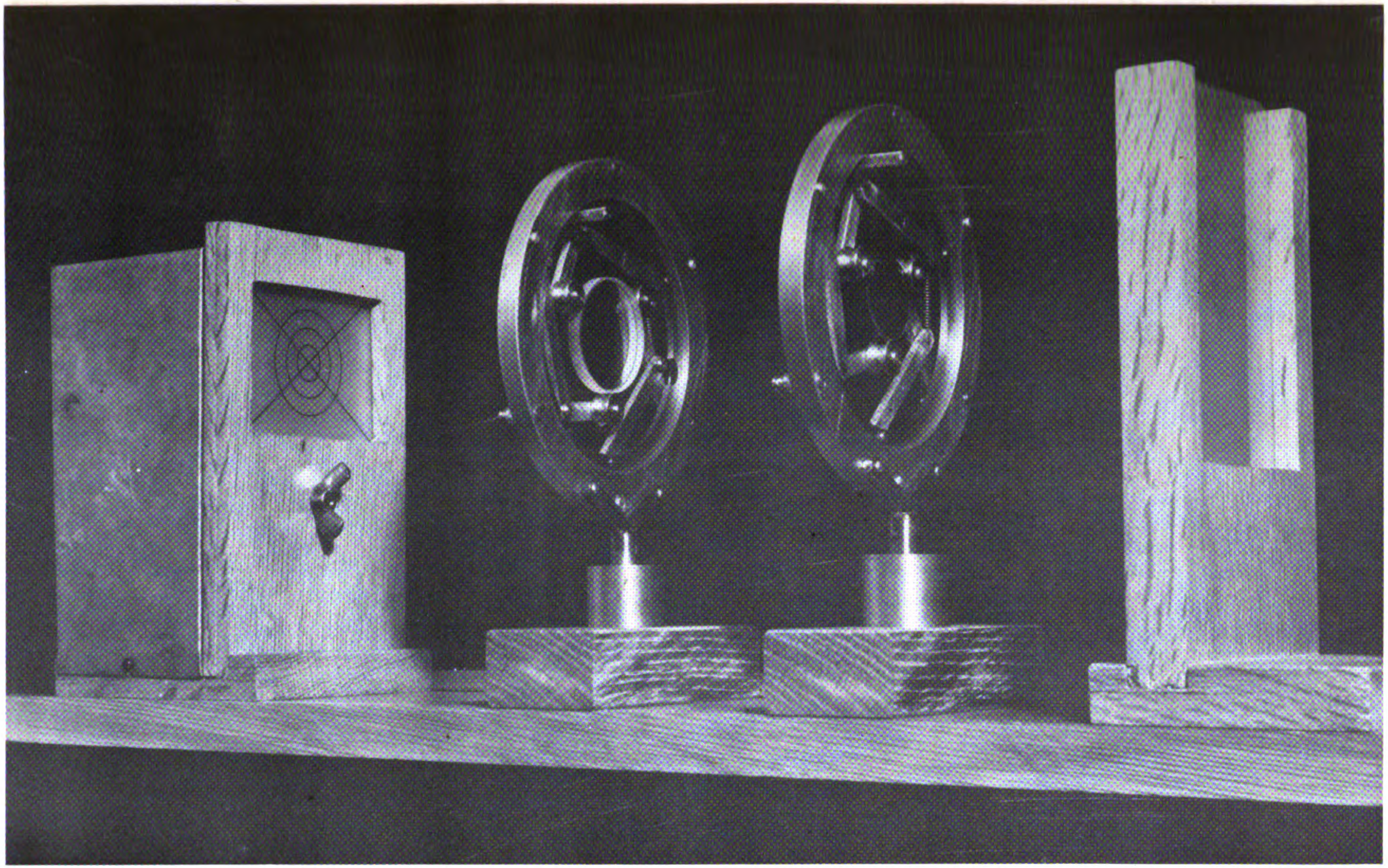

Figure I. - Optical bench and accessories.

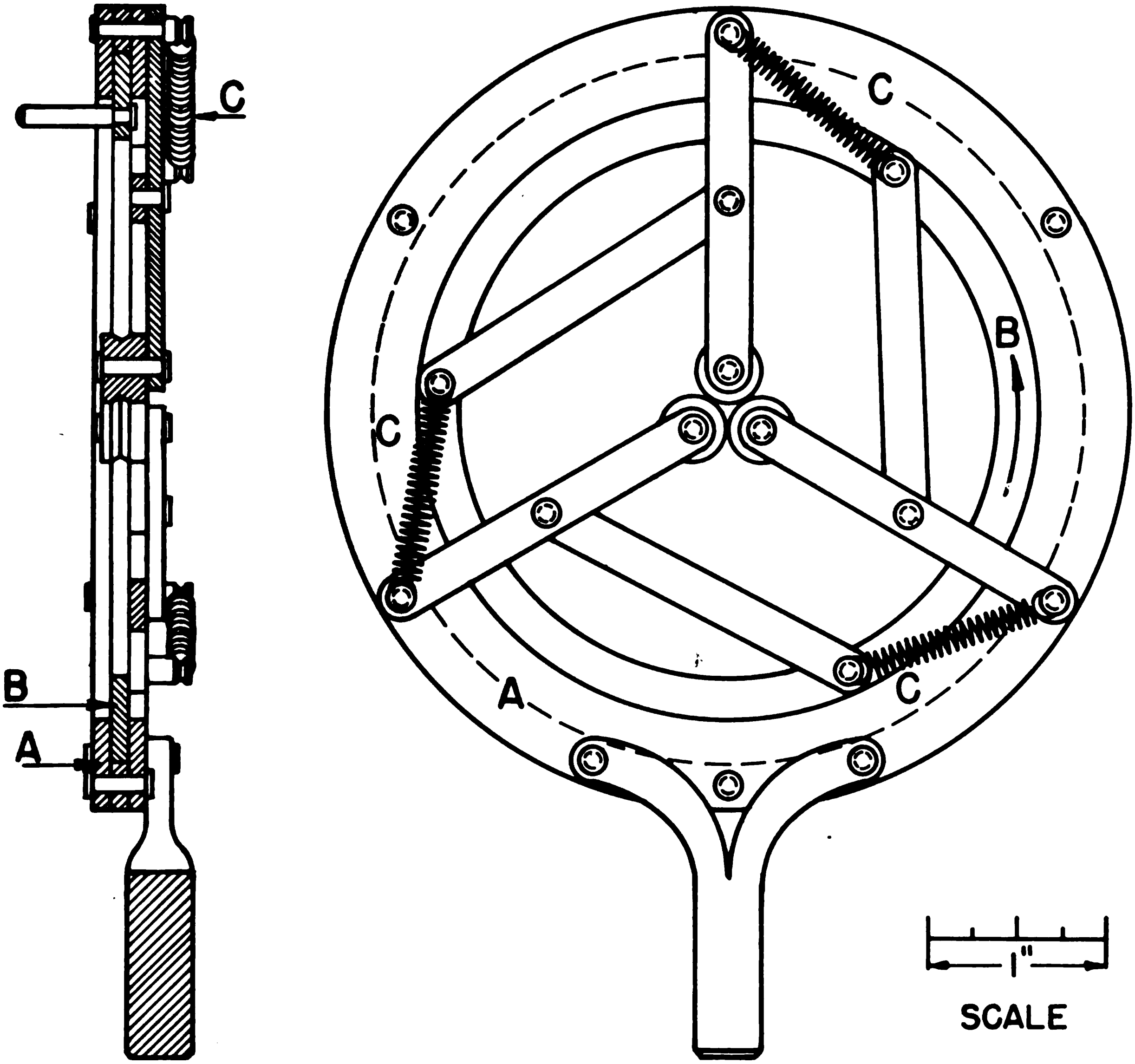

Figure 2. - Lens holder.